

Study Guide

For use with pages 431–435

GOAL Graph and solve systems of linear equations.**VOCABULARY**

A **system of linear equations**, or simply a *linear system*, consists of two or more linear equations with the same variables.

A **solution of a linear system** in two variables is an ordered pair that is a solution of each equation in the system.

EXAMPLE 1 Solving a System of Linear EquationsSolve the linear system: $y = 4x - 2$ **Equation 1** $y = 3x + 1$ **Equation 2**

- (1) Graph the equations.
- (2) Identify the apparent intersection point, (3, 10).
- (3) Verify that (3, 10) is the solution of the system by substituting 3 for x and 10 for y in each equation.

Equation 1

$$y = 4x - 2$$

$$10 \stackrel{?}{=} 4(3) - 2$$

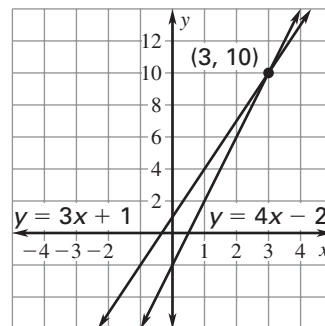
$$10 = 10 \checkmark$$

Equation 2

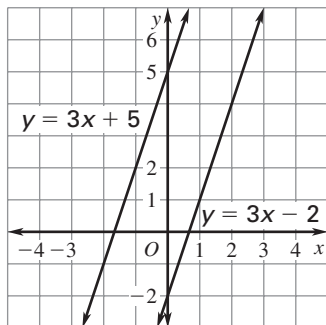
$$y = 3x + 1$$

$$10 \stackrel{?}{=} 3(3) + 1$$

$$10 = 10 \checkmark$$

**Answer:** The solution is (3, 10).**EXAMPLE 2** Solving a Linear System with No SolutionSolve the linear system: $y = 3x + 5$ **Equation 1** $y = 3x - 2$ **Equation 2**

Graph the equations. The graphs appear to be parallel lines. You can confirm that the lines are parallel by observing from their equations that they have the same slope, 3, but different y -intercepts, 5 and -2 .

**Answer:** Because parallel lines do not intersect, the linear system has no solution.

Study Guide

For use with pages 431–435

EXAMPLE 3 Solving a Linear System with Many SolutionsSolve the linear system: $2y + 14x = -6$ **Equation 1**

$3 + y = -7x$ **Equation 2**

Write each equation in slope-intercept form.

Equation 1

$2y + 14x = -6$

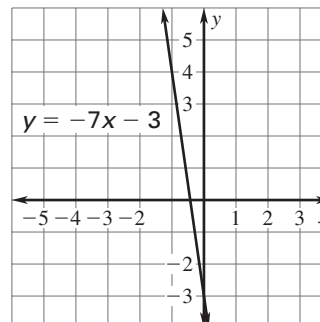
$2y = -14x - 6$

$y = -7x - 3$

Equation 2

$3 + y = -7x$

$y = -7x - 3$



The slope-intercept forms of equations 1 and 2 are identical, so the graphs of the equations are the same line.

Answer: Because the graphs have infinitely many points of intersection, the system has infinitely many solutions. Any point on the line $y = -7x - 3$ represents a solution.

EXAMPLE 4 Writing and Solving a Linear System

Cable company A charges \$50 per month, plus an initial set-up fee of \$80. Cable company B charges \$40 per month, plus an initial fee of \$150.

- After how many months are the total charges of the cable companies the same?
- When is company B's cable a better deal?

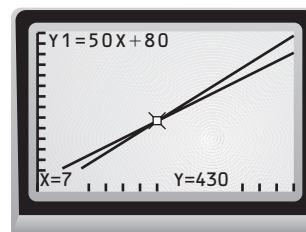
Solution

- Let y be the charges of each company after x months.

Company A: $y = 50x + 80$

Company B: $y = 40x + 150$

Use a graphing calculator to graph the equations. Trace along one of the graphs until the cursor is on the point of intersection. This point is $(7, 430)$.



Answer: The total charges of each company are the same after 7 months, when each company charges \$430.

- The graph for company B's charges is below the graph of company A's charges when $x > 7$, so cable with company B is cheaper if you have cable for more than 7 months.

Exercises for Examples 1–4

In Exercises 1–3, solve the linear system by graphing.

1. $2y = 14x + 18$

$3y - 21x = 27$

2. $y + 6 = 4x$

$y - 8x = -2$

3. $5y = -45x + 5$

$27x + 3y = -9$

- Festival A charges \$6 admission plus \$1 per ride. Festival B charges \$2 admission plus \$2 per ride. When is festival A a better deal?